but a piece of thin metal with a square cut out, as shown in Fig. 10, may be substituted. In either case the square must be of such a size that it covers one sq. mm. on the stage with a given combination of objective and ocular, and a certain tube length to be found by comparison with a stage micrometer. It is an advantage to have at hand higher powers for a more thorough study of the organisms met with, but for ordinary work the powers suggested are sufficient.

All this apparatus, together with bottles for collection and note book for records may be carried in a grip sack, and this will be found generally the most convenient way. It is possible, however, to make a neat box, with compartments for holding the microscope, funnels, tube vials, etc., and I respectfully submit this to manufacturers of microscopical supplies.

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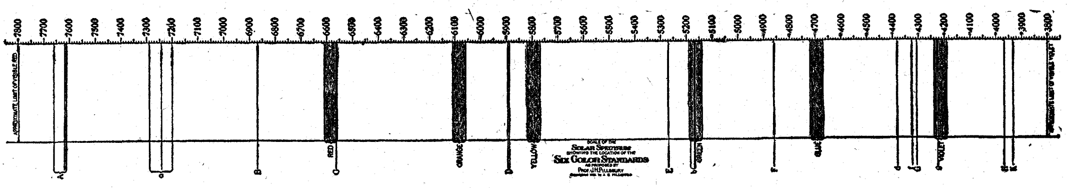
SPECTRUM COLOR STANDARDS.

THE extensive adoption of the *color standards* proposed by me and put into practical form for educational purposes by Mr. Milton Bradley, of Springfield, Mass., leads me to offer the readers of SCIENCE an opportunity to examine a chart of the solar spectrum after Rowland with the standard colors located upon it. The importance of making the spectrum the basis of all our work in color is recognized by all, and I have received many appreciative communications from eminent men in scientific and educational circles, both in this country and England, expressing approbation of the effort to bring our now greatly confused color nomenclature within some accurate and practical system. The idea of teaching color by a system thus definitely defined has also proved to be very practical, not only in elementary instruction, but in the more exacting art work. This rapidly increasing public interest in the subject makes it seem likely that the accompaning chart will be of interest.



A few observations on the practical application of these standards will illustrate the value of the scheme. The area representing each particular standard in the chart is narrow enough to allow of no perceptible difference in the hue of the two sides of the area when viewed through the spectroscope and is still wide enough to give a clear working field. Moreover, the areas selected coincide with the views of a large number of persons experienced in the discrimination of color and well prepared, therefore, to judge what would be of practical value as color standards and applicable to the various needs of the arts as well as to science and to educational purposes. And still again, though there was no direct reference to the theories of color vision, these standards having been first proposed nearly fifteen years since, the standards prove to have been happily selected as regards the more recent theories of color vision. Another very important consideration is the fact that the quality of any color which I have yet seen can be obtained by the union of two of these standards. Of course, the intensity of one of the two compared colors will generally have to be modified to obtain a perfect match, but I have never yet been unable to do this. In a

series of comparisons now before me, including many of the brilliant colors of silk ribbons recently so fashionable, I have had to reduce the intensity of the color to be reproduced, in only two out of sixty cases. This comparison was made by means of Maxwell discs made from the Bradley educational papers. For all practical purposes some form of paper or card board disc seems more convenient and proves quite satisfactory, as the above statement shows While it is possible to get somewhat more of brilliancy in silk than in pigment-covered papers, I have not found the increased brilliancy of sufficient value to compensate for the difficulty of making silk-covered discs that can be conveniently operated.

For educational purposes it seems to me of first importance that the child (and many adults are children in this regard) should start out with some clear and correct idea of a few pure spectrum colors. It does not matter essentially just how many of these colors he is taught, only that he gets a definite conception of those of which he learns. The reason for taking six for this series of standards was that I found that it was very difficult to get any practical scheme of color teaching based on a less number of standards. The mixing of two standards by means of the color wheel always reduces the strength of the resulting color. For example, the mixing of red and yellow on the wheel will produce orange, but it will not be as strong an orange as that of the standard paper. It will be a broken orange. Using the nomenclature adopted in my former articles (SCIENCE, February 26, '92, and June 9, '93) we have the result represented as follows: R 82 Y 18 gives the same effect as O 55 W 2 N 43. This can be best tested by using two sizes of discs. The larger should be compounded of red and yellow in the proportions just given and the smaller of orange, white and black as indicated. In this way the result is very satisfactory in fairly strong and pure diffused sunlight. The same principle will apply to all the colors of the spectrum. But the extent to which the effect of a broken color is produced will be increased, as the colors differ more widely in luminosity, or are more widely separated in the solar spectrum. Hence a smaller number of standards makes the practical use of the standards more difficult in the pupil's study of the colors by the use of the Maxwell discs. If we take a larger number of colors than six it becomes more difficult to designate them clearly in the solar spectrum, and the system becomes more complex. As there is quite general agreement that indigo shall not be used as a name for a spectrum color, the most natural and far the most convenient terms are those used in the scheme already referred to. When the pupil becomes familiar with these standard colors he is prepared to make very rapid progress in color study. The combination of these standards will give a ready appreciation of the nature of the purer color in objects about him and prepare the way for the analysis of colors, first those of a pure tone and afterwards of broken colors. The next stage would be the teaching of color harmonies. This most difficult part of the work becomes relatively easy by means of educational papers constructed on so simple a plan as this. It is surprising to see what results are obtained in the schools where this system has been followed.

It seems not inappropriate in this connection to call attention to an attempt to apply the principles upon which I have worked with a somewhat different set of standards from those I have used under the article 'spectrum' in the Standard Dictionary. In the first place there is no pure red used in the system, that called red being an orange red, as represented by the pigment vermilion. Nor is there any violet

used in the scheme, except by an unintended blunder, by which the wave-length of ultramarine is given as .4250, which would bring the standard blue designated into the clear violet of the spectrum and not distinguishable from the violet of my standards. The wave-length of ultramarine is not far from .4500. With no pure red or violet in a scheme of standard colors it is quite impossible to obtain or to represent accurately a very large line of important hues. The author of the article has been obliged, because of this defect in the standards he has selected, in many of the analyses of popular colors given in the table accompanying the article, to use three or four standards to represent the color he has analyzed where two pure spectrum colors are all that are needed. It is to be regretted that a publication like this should have added anything to the confusion which we are seeking to remedy. And this is still more to be regretted because the publishers of the Dictionary asked for and received from me the measurements and explanations of the plan upon which I had been working with the professed purpose of furthering the extension of the plan. This will not be as serious a matter, however, as it otherwise would have been, since the rapid introduction of the Bradley papers into the public schools gives an opportunity for the correct teaching of color to an enormous number of children.

J. H. PILLSBURY.

STONEHAM, MASS., June, '97.

PLEISTOCENE FOSSILS FROM BAFFINLAND AND GREENLAND.

THE existence of Pleistocene deposits in Labrador,* in several of the islands of the Arctic archipelago,† and in northern Greenland,‡ has been made known by several observers, but, so far as the writer is aware, none have previously been reported from Baffinland. The discovery of Pleistocene shells during the past summer on the south coast of Baffinland is, therefore, of interest as showing that at least a part of this island, which is the largest of the Arctic archipelago, was also affected by the subsidence which lowered the lands to the north and the south of it beneath the sea during the Pleistocene.

* Mem. Bost. Soc. Nat. Hist., Vol. 1, pp. 229–230.

† Jour. Geol. Soc., Vol. 9, p. 317.

‡ Jour. Geol. Soc., Vol. 3, p. 100.

Short trips were made into the interior by members of the Cornell University party from two points on the coast north of Hudson Strait. The first of these excursions was from a point opposite Big Island, in about long. 70 W., and the second some ten or twelve miles east of the first. At both localities Pleistocene shells were found in small lake basins a short distance from the coast at elevations from 100 to 200 feet above sea level. At two localities the shells were found in abundance, occurring in a fine blue clay mixed with some sand. These fossiliferous deposits do not occur in all of the basins and valleys, which are very numerous in this region. In most of them they appear to be absent.

The following is a list of the species arranged in the order of their abundance, which were obtained from a deposit of blue clay about 150 feet above sea level:* *Saxicava arctica*, *Mya truncata*, *Rhynchonella psittacea*, *Astarte compressa?* *Balanus crenatus*, *Pecten icelandicus*, *Lepeta cœca*.

In the interior of Big Island, Mr. T. L. Watson found Pleistocene shells at an elevation of 270 feet. The species which he obtained are *Mya truncata* and *Macoma subulosa*.

The Greenland shells are especially interesting because of the peculiar manner of

* The writer is indebted to Professor H. S. Williams for the use of specimens for comparison, and to Miss Katharine J. Bush for assistance in the determination of species.